

CLAIMS

1. A gas turbine engine exhaust nozzle comprising:
a nacelle having an inlet at a forward end, a main outlet at an aft end, and a main duct extending therebetween; and
a secondary bypass duct extending radially through said nacelle upstream of said main outlet, and having an unobstructed secondary inlet disposed continuously in flow communication with said main duct, and a secondary outlet surrounding said main outlet for collectively discharging with said main outlet exhaust flow in confluent streams.
2. A nozzle according to claim 1 wherein said nacelle includes radially outer and inner skins bounding said secondary duct, with said outer skin terminating at said secondary outlet, and said inner skin extending aft therefrom to terminate at said main outlet.
3. A nozzle according to claim 2 wherein said main and secondary outlets are axially spaced apart in parallel planes.
4. A nozzle according to claim 3 wherein said secondary inlet comprises a row of circumferentially spaced apart inlet apertures disposed through said inner skin.
5. A nozzle according to claim 4 further comprising:
a radial frame extending circumferentially between said outer and inner skins forward of said apertures; and
a plurality of longitudinal frames extending axially from said radial frame and disposed circumferentially between corresponding ones of said apertures.
6. A nozzle according to claim 5 wherein said outer and inner skins converge aft to said secondary and main outlets, respectively.
7. A nozzle according to claim 6 wherein said main and secondary ducts converge aft

toward said main and secondary outlets thereof to provide concentric and confluent exhaust flow discharge therefrom.

8. A nozzle according to claim 7 wherein said main and secondary outlets are sized in flow area to collectively discharge exhaust from a gas turbine engine at the cruise design point thereof.

9. A nozzle according to claim 7 wherein said secondary duct includes a plurality of flow deflectors fixedly joined between said outer and inner skins and between corresponding ones of said longitudinal frames.

10. A nozzle according to claim 9 wherein:
said apertures are elongate circumferentially between said longitudinal frames; and
each of said deflectors is inclined rearwardly over a respective one of said apertures for guiding said exhaust flow aft toward said secondary outlet.

11. A nozzle according to claim 10 wherein said longitudinal frames are imperforate and terminate short of said secondary outlet, and said secondary outlet forms an annulus extending circumferentially at least in part over a plurality of said longitudinal frames, deflectors, and apertures for commonly discharging said exhaust flow therefrom.

12. A nozzle according to claim 7 further comprising a core nacelle spaced radially inwardly from an aft portion of said inner skin to define a fan bypass duct as said main duct, and said surrounding nacelle defines a fan nacelle.

13. A nozzle according to claim 7 wherein said nacelle extends downstream past a core engine disposed therein, and said main outlet defines a common outlet for both combustion gas exhaust discharged from said core engine, and fan bypass air exhaust discharged from a surrounding fan bypass duct.

14. A nozzle according to claim 13 further comprising a thrust reverser disposed in said nacelle upstream from said secondary bypass duct.
15. An exhaust nozzle for a turbofan gas turbine engine comprising:
a nacelle having an inlet at a forward end, a main outlet at an aft end, and a main duct extending therebetween;
a secondary bypass duct extending radially through said nacelle upstream of said main outlet, and having an unobstructed secondary inlet disposed continuously in flow communication with said main duct, and a secondary outlet surrounding said main outlet; and
said main and secondary outlets are sized in flow area to collectively discharge exhaust in confluent streams from said turbofan engine at the cruise design point thereof.
16. A nozzle according to claim 15 wherein said nacelle includes radially outer and inner skins bounding said secondary duct, with said outer skin terminating at said secondary outlet, and said inner skin extending aft therefrom to terminate at said main outlet.
17. A nozzle according to claim 16 wherein said main and secondary outlets are axially spaced apart in parallel planes.
18. A nozzle according to claim 16 wherein said outer and inner skins converge aft to said secondary and main outlets, respectively.
19. A nozzle according to claim 16 wherein said main and secondary ducts converge aft toward said main and secondary outlets thereof to provide concentric and confluent exhaust flow discharge therefrom.
20. A nozzle according to claim 16 wherein said secondary inlet comprises a row of circumferentially spaced apart inlet apertures disposed through said inner skin.
21. A nozzle according to claim 20 further comprising:

a radial frame extending circumferentially between said outer and inner skins forward of said apertures; and

a plurality of longitudinal frames extending axially from said radial frame and disposed circumferentially between corresponding ones of said apertures.

22. A nozzle according to claim 21 wherein said secondary duct includes a plurality of flow deflectors fixedly joined between said outer and inner skins and between corresponding ones of said longitudinal frames.

23. A nozzle according to claim 22 wherein:
said apertures are elongate circumferentially between said longitudinal frames; and
each of said deflectors is inclined rearwardly over a respective one of said apertures for guiding said exhaust flow aft toward said secondary outlet.

24. A nozzle according to claim 23 wherein said longitudinal frames are imperforate and terminate short of said secondary outlet, and said secondary outlet forms an annulus extending circumferentially at least in part over a plurality of said longitudinal frames, deflectors, and apertures for commonly discharging said exhaust flow therefrom.

25. A nozzle according to claim 24 further comprising a core nacelle spaced radially inwardly from an aft portion of said inner skin to define a fan bypass duct as said main duct, and said surrounding nacelle defines a fan nacelle.